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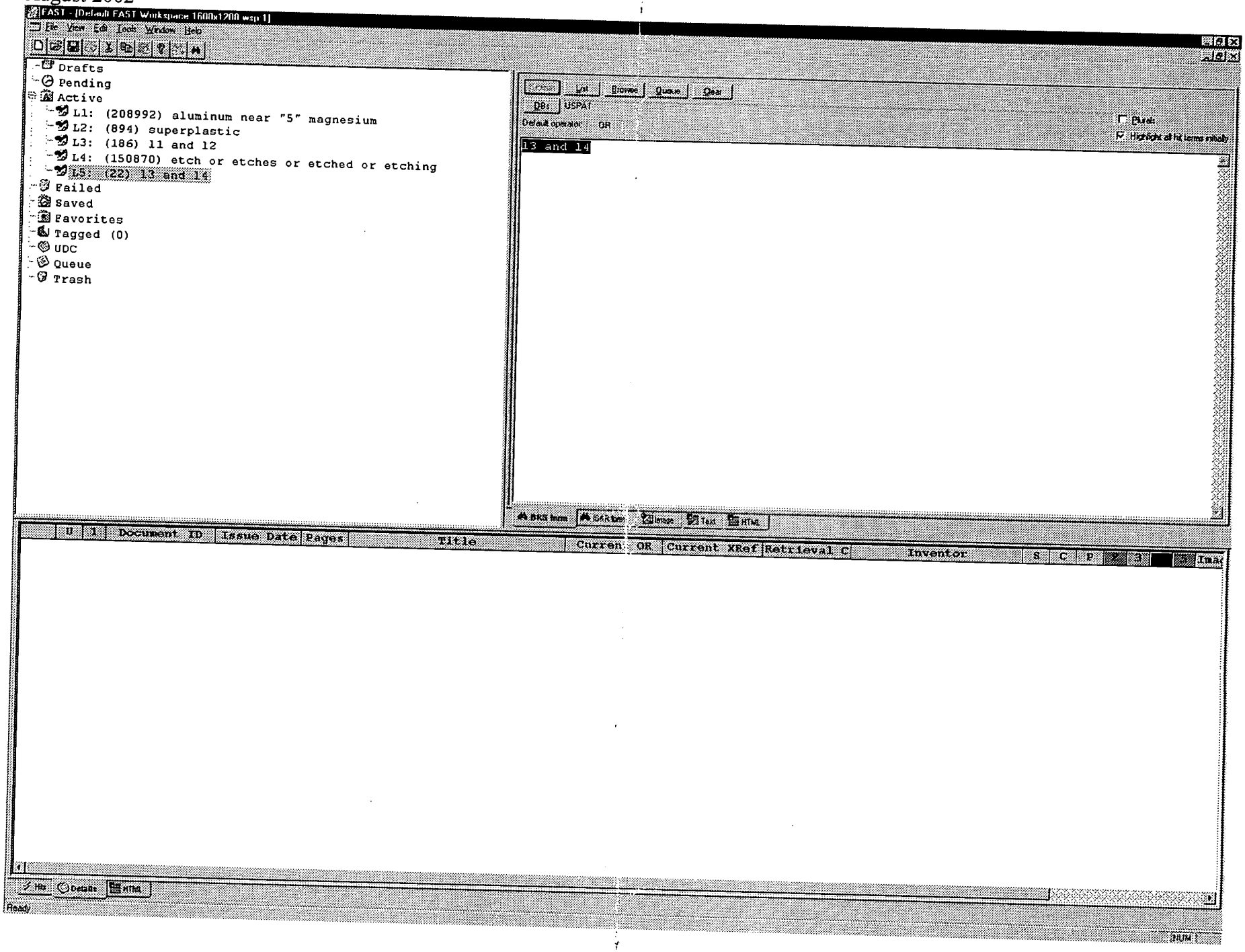
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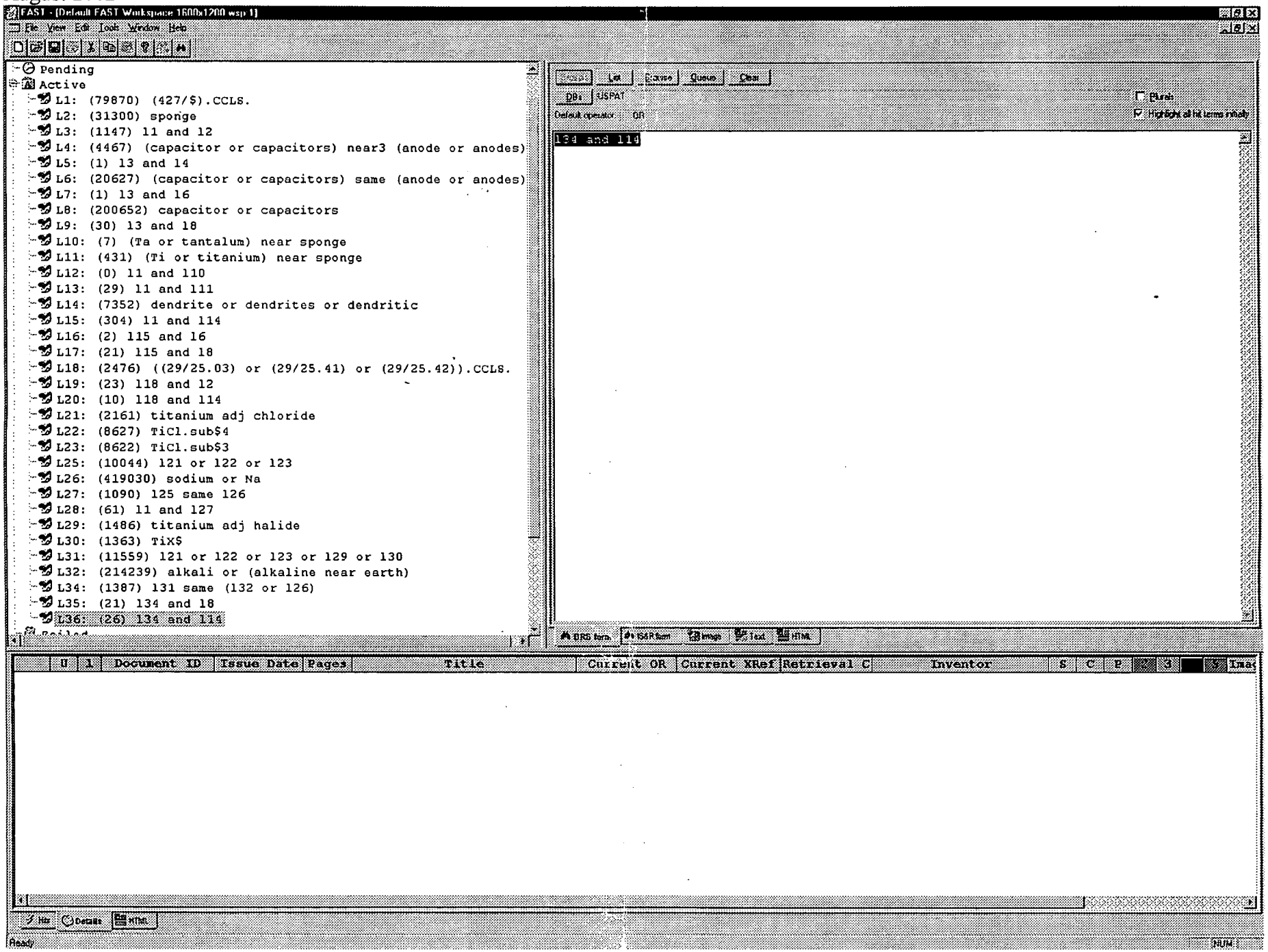
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L8: (200652) capacitor or capacitors
L9: (30) l3 and l8
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L13: (29) l1 and l11
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L23: (8622) TiCl.sub$3
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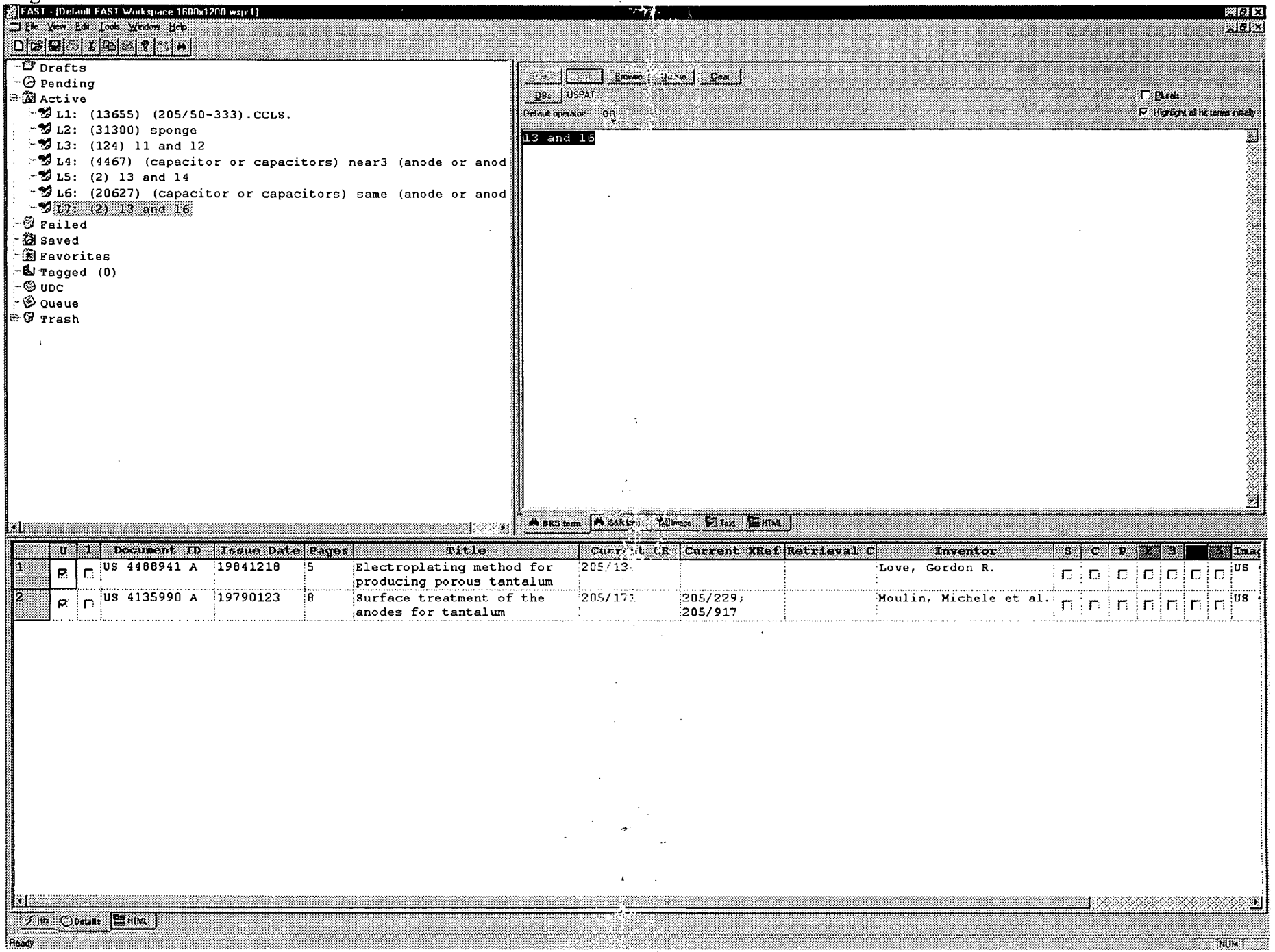
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Electroplating method for producing porous tantalum
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205/229; 205/917
Moulin, Michele et al.
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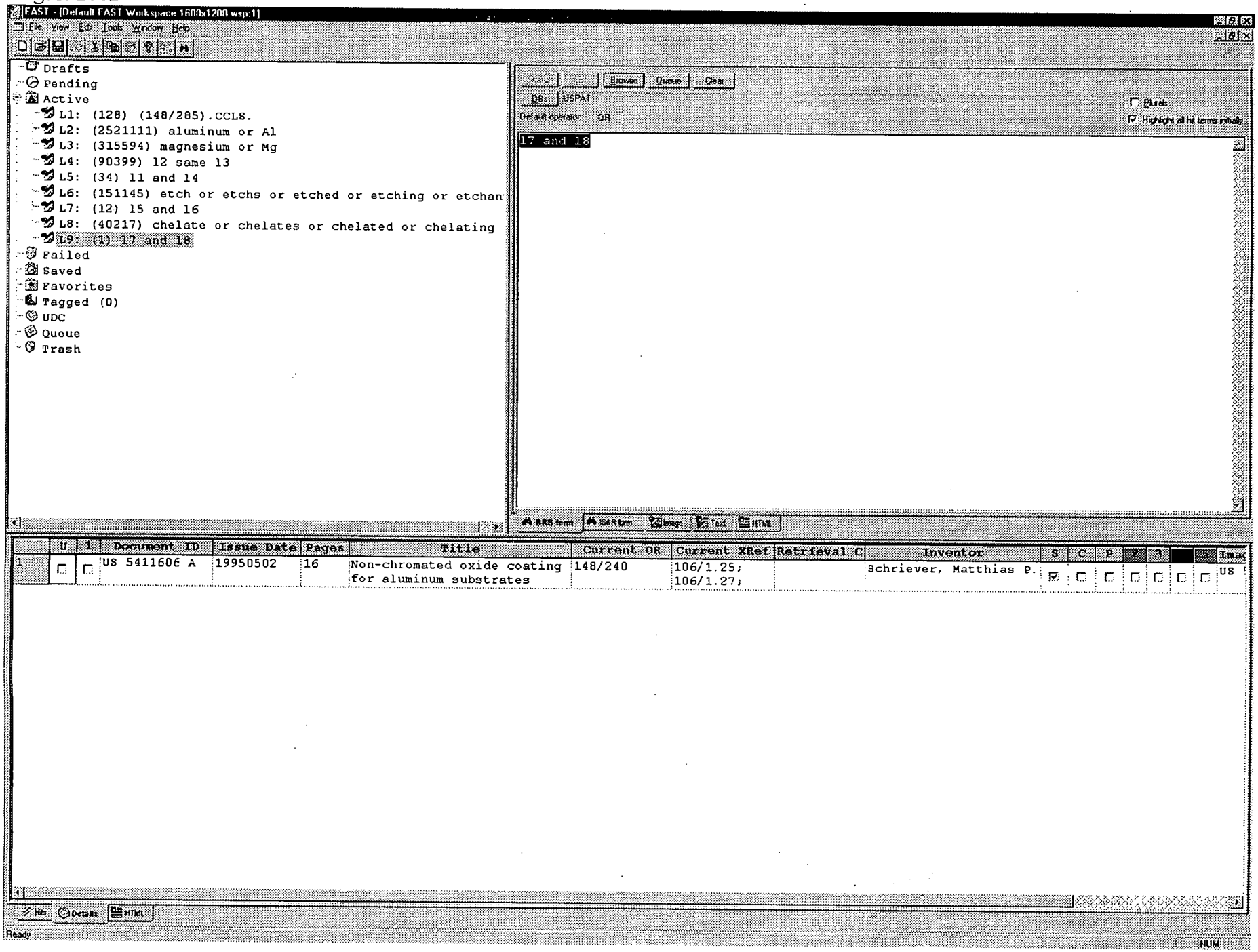
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US 5411606 A
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Non-chromated oxide coating for aluminum substrates
148/240
106/1.25; 106/1.27;
Schriever, Matthias P.
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US 5411606 A	16						☑			USPAT	

Utilizing the basic corrosion resistance behavior of complexed cobalt salts, as shown above, the cobalt acetate formulations were investigated extensively. Cobalt acetate was complexed with sodium acetate Na(C.sub.2 H.sub.3 O.sub.2).3 H.sub.2 O or magnesium acetate Mg (C.sub.2 H.sub.3 O.sub.2).sub.2.4H.sub.2 O. The results show that these formulations have excellent corrosion resistance without a subsequent seal step. Salt spray corrosion testing was conducted in accordance with ASTM B117 and all specimens were subjected to 168 hr. exposure. See Tables III and IV for results. The test conditions were repeated two more times and near identical results to Tables III and IV were obtained. Analysis of this data in conjunction with basic paint adhesion data, as well as other solution maintenance parameters has resulted in the optimum tank makeup and controls as listed under Table II, above. A final question on corrosion performance and color iridescence was answered with this work. This research established why sodium acetate Na(C.sub.2 H.sub.3 O.sub.2).3H.sub.2 O was chosen as the most preferred complexer over magnesium acetate Mg (C.sub.2 H.sub.3 O.sub.2).sub.2.4H.sub.2 O. The reason is that sodium acetate imparts a somewhat more aggressive etch effect on the aluminum substrate. This by itself was found to be very detrimental to corrosion performance. However, when sodium acetate was chemically formulated with wetting agents and metal fluorides, it had the distinct advantage that bright color iridescence of coatings were maintained while corrosion resistance was not impaired. On the other hand, when magnesium acetate or calcium acetate were utilized in conjunction with the wetting agents and metal fluorides very little etch effect was imparted and resultant coatings were rather weak in color effect.

Claims Text - CLTX (57):

41. A chemical conversion coating solution for producing an oxide film cobalt conversion coating on a metal substrate, wherein said substrate is aluminum or aluminum alloy, said solution comprising an aqueous reaction solution comprising a soluble cobalt-III hexacoordinated complex, wherein said cobalt-III hexacoordinated complex is present in the form of Me.sub.m [Co(R).sub.6].sub.n, wherein Me is one or more selected from the group consisting of Na, Li, K, Ca, Zn, Mg and Mn, and wherein m is 2 or 3, n is 1 or 2, and R is a carboxylate having from 1 to 5 C atoms, the concentration of said cobalt-III hexacoordinated complex being from about 0.01 mole per liter of said aqueous reaction solution up to the saturation limit of said cobalt-III hexacoordinated complex.

Claims Text - CLTX (105):

70. A process for forming an oxide film cobalt conversion coating exhibiting corrosion resistance and paint adhesion properties on a substrate, wherein said substrate is aluminum, aluminum alloy, magnesium, magnesium alloy, a Cd plated substrate, or a Zn--Ni plated substrate, said process comprising the steps of:

Current US Cross Reference Classification - CCXR (6):

148/265

Other Reference Publication - OREF (15):

A. Martell and M. Calvin, Chemistry Of The Metal Chelate Compounds, pp. 1-18 (Prentice-Hall 1952).

only mentions chelate

US005411606A

United States Patent [19]

Schriever

[11] Patent Number: 5,411,606

[45] Date of Patent: May 2, 1995

[54] NON-CHROMATED OXIDE COATING FOR ALUMINUM SUBSTRATES

[75] Inventor: Matthias P. Schriever, Kent, Wash.

[73] Assignee: The Boeing Company, Seattle, Wash.

[21] Appl. No.: 903,883

[22] Filed: Jun. 25, 1992

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 525,800, May 17, 1990, Pat. No. 5,298,092, and a continuation-in-part of Ser. No. 621,122, Nov. 30, 1990, abandoned, and a continuation-in-part of Ser. No. 732,568, Jul. 19, 1991, abandoned.

[51] Int. Cl.[6] C23C 22/00

[52] U.S. Cl. 148/240; 106/1.25; 106/1.27; 148/243; 148/273; 148/275; 148/285; 148/286

[58] Field of Search 148/240, 243, 273, 275, 148/285, 286; 106/1.25, 1.27

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Primary Examiner—Melvyn J. Andrews
Assistant Examiner—Robert R. Koehler
Attorney, Agent, or Firm—Paul C. Cullom, Jr.

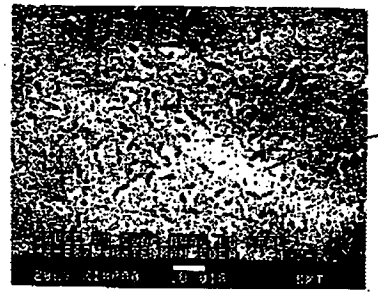
[57] ABSTRACT

(A) A process for forming an oxide film cobalt conversion coating on a metal substrate, thereby imparting corrosion resistance and paint adhesion properties. The invention was developed as a replacement for the prior art chromic acid process. The process includes the steps of: (a) providing a cobalt conversion solution comprising an aqueous reaction solution containing a soluble cobalt-III hexacoordinated complex, the concentration of the cobalt-III hexacoordinated complex being from about 0.01 mole per liter of solution to the solubility limit of the cobalt-III hexacoordinated complex; and (b) contacting the substrate with the aqueous reaction solution for a sufficient amount of time, whereby the cobalt conversion coating is formed. The substrate may be aluminum or aluminum alloy, as well as Cd plated, Zn plated, Zn—Ni plated, and steel. The cobalt-III hexacoordinated complex may be present in the form of $Me_m[Co(R)_6]_n$, wherein Me is Na, Li, K, Ca, Zn, Mg, or Mn, and wherein m is 2 or 3, n is 1 or 2, and R is a carboxylate having from 1 to 5 C atoms.

(B) A chemical conversion coating solution for producing the cobalt conversion coating on a metal substrate, the solution including an aqueous reaction solution containing a soluble cobalt-III hexacoordinated complex, the concentration of the cobalt-III hexacoordinated complex being from about 0.01 mole per liter of solution to the solubility limit of the cobalt-III hexacoordinated complex.

(C) A coated article exhibiting acceptable corrosion resistance and paint adhesion properties, the article including: (a) a metal substrate; and (b) an oxide film cobalt conversion coating formed on the substrate, the cobalt conversion coating including aluminum oxide Al_2O_3 as the largest volume percent, and cobalt oxides CoO, Co_2O_3, and Co_3O_4.

81 Claims, 3 Drawing Sheets



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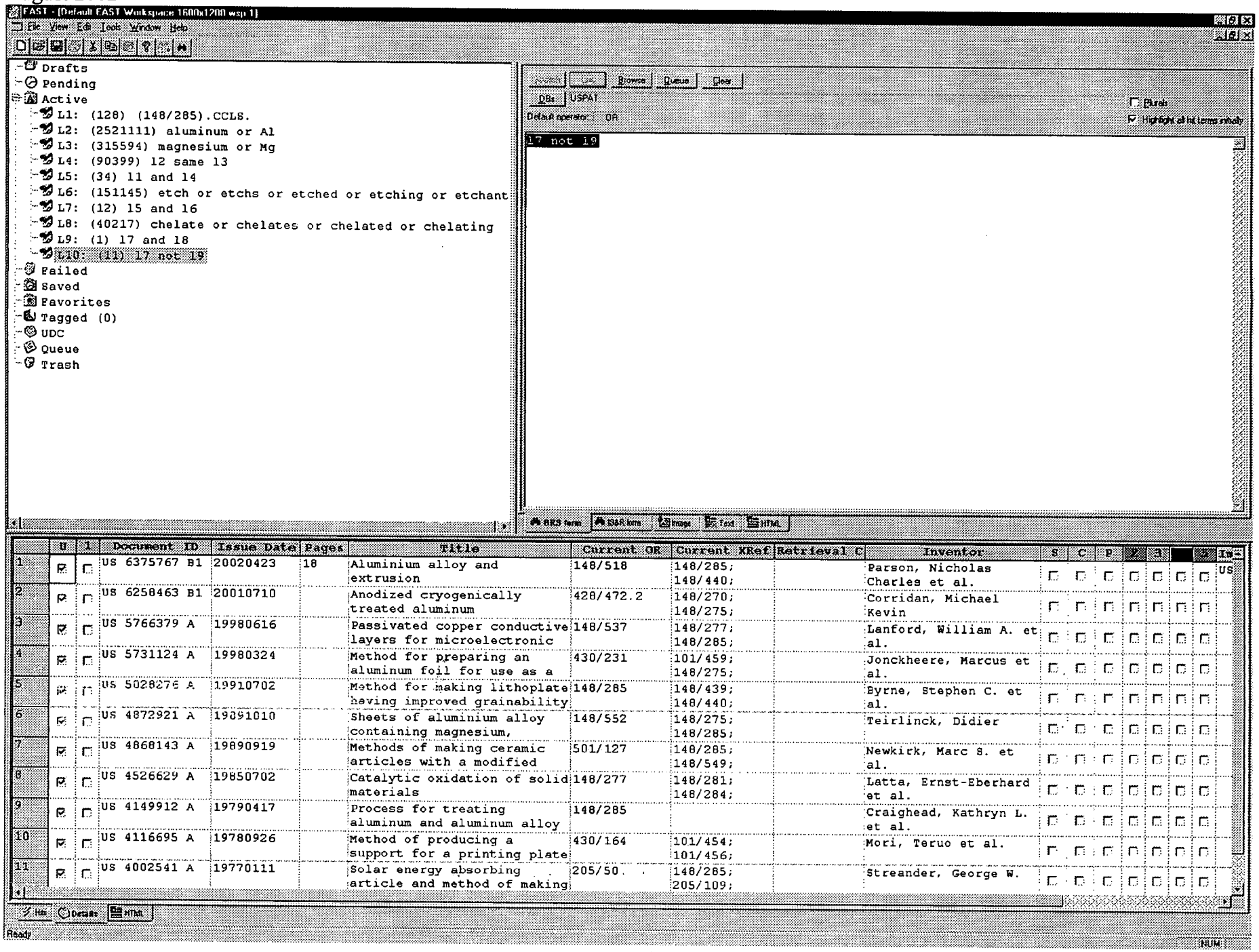

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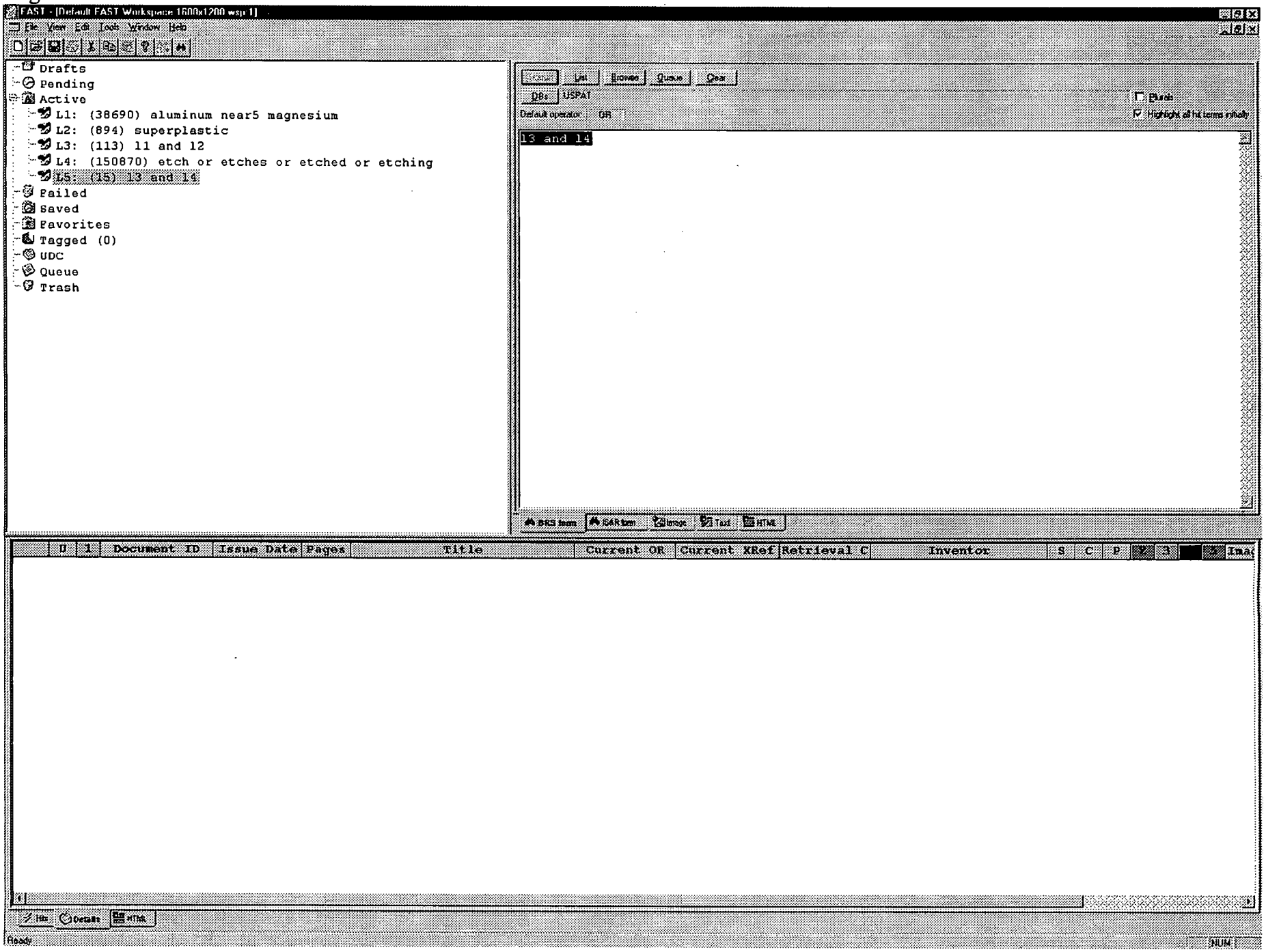
1	☑	☐	US 6375767 B1	20020423	18	Aluminium alloy and extrusion	148/518	148/285; 148/440;		Parson, Nicholas Charles et al.	☐	☐	☐	☐	☐	☐	☐	US
2	☑	☐	US 6258463 B1	20010710		Anodized cryogenically treated aluminum	428/472.2	148/270; 148/275;		Corridan, Michael Kevin	☐	☐	☐	☐	☐	☐	☐	
3	☑	☐	US 5766379 A	19980616		Passivated copper conductive layers for microelectronic	148/537	148/277; 148/285;		Lanford, William A. et al.	☐	☐	☐	☐	☐	☐	☐	
4	☑	☐	US 5731124 A	19980324		Method for preparing an aluminum foil for use as a	430/231	101/459; 148/275;		Jonckheere, Marcus et al.	☐	☐	☐	☐	☐	☐	☐	
5	☑	☐	US 5028276 A	19910702		Method for making lithoplate having improved grainability	148/285	148/439; 148/440;		Byrne, Stephen C. et al.	☐	☐	☐	☐	☐	☐	☐	
6	☑	☐	US 4872921 A	19891010		Sheets of aluminium alloy containing magnesium,	148/552	148/275; 148/285;		Teirlinck, Didier	☐	☐	☐	☐	☐	☐	☐	
7	☑	☐	US 4868143 A	19890919		Methods of making ceramic articles with a modified	501/127	148/285; 148/549;		Newkirk, Marc S. et al.	☐	☐	☐	☐	☐	☐	☐	
8	☑	☐	US 4526629 A	19850702		Catalytic oxidation of solid materials	148/277	148/281; 148/284;		Latta, Ernst-Eberhard et al.	☐	☐	☐	☐	☐	☐	☐	
9	☑	☐	US 4149912 A	19790417		Process for treating aluminum and aluminum alloy	148/285			Craighead, Kathryn L. et al.	☐	☐	☐	☐	☐	☐	☐	
10	☑	☐	US 4116695 A	19780926		Method of producing a support for a printing plate	430/164	101/454; 101/456;		Mori, Teruo et al.	☐	☐	☐	☐	☐	☐	☐	
11	☑	☐	US 4002541 A	19770111		Solar energy absorbing article and method of making	205/50	148/285; 205/109;		Streander, George W.	☐	☐	☐	☐	☐	☐	☐	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3	US 5183602 A	13							☑				USPAT
4	US 5125971 A	20							☑				USPAT
5	US 5111570 A	13							☑				USPAT
6	US 5064790 A	10							☑				USPAT
7	US 4890784 A	7							☑				USPAT
8	US 4732312 A	18							☑				USPAT

is estimated that the solidification will be completed in two to three hours.

Detailed Description Text - DETI (14):

When using the process of the subject invention with aluminum alloys, it is necessary to first chemically clean and degrease the surfaces to be joined. This is needed to remove impurities from the aluminum alloy surface. Alternatively, the entire substrate surface may be treated. Chemical cleaning is conventionally accomplished with a degreasing solvent such as trichloroethylene, naptha, or liquid chlorinated hydrocarbons. The surface may also be chemically etched using a solution of hydrochloric acid, nitric acid, or sulphuric acid. Another chemical cleaning technique involves successive alkali and acid washings.

Claims Text - CLTX (8):

3. The method of diffusion bonding as recited in claim 2 wherein said interlayer is essentially an aluminum-magnesium alloy.

Claims Text - CLTX (30):

25. The method of diffusion bonding as recited in claim 1 wherein said interlayer is essentially an aluminum-magnesium alloy.

In diffusion bonding, there would be no subsequent coating

United States Patent [19]

Bampton

[11] **Patent Number: 4,890,784**

[45] **Date of Patent: Jan. 2, 1990**

[54] **METHOD FOR DIFFUSION BONDING ALUMINUM**

[75] Inventor: Clifford C. Bampton, Thousand Oaks, Calif.

[73] Assignee: Rockwell International Corporation, El Segundo, Calif.

[21] Appl. No.: 479,225

[22] Filed: Mar. 28, 1983

[51] Int. Cl.[4] B23K 20/14

[52] U.S. Cl. 228/194; 228/198; 228/263.17

[58] Field of Search ..... 228/194, 195, 198, 203, 228/263.17, 217; 148/12.7 A

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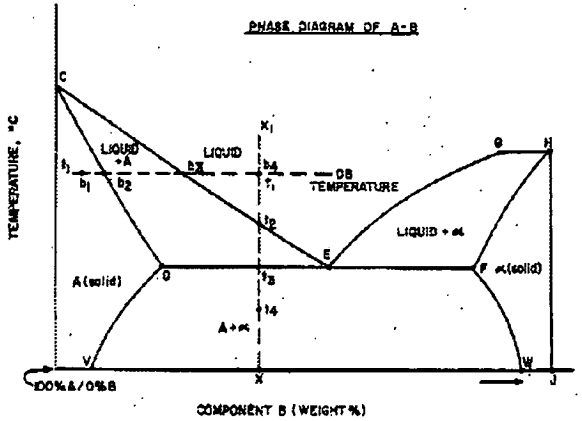
Primary Examiner—Kenneth J. Ramsey

Attorney, Agent, or Firm—Charles T. Silberberg

[57] ABSTRACT

Diffusion bonding of aluminum alloys is performed using a thin alloy interlayer placed between mating surfaces of the alloy members to be bonded, the interlayer having a specific composition which is dependent upon the composition of the alloy members, the diffusion bonding temperature, the interdiffusion rate of the alloy members compared with the interlayer, and the solid state diffusion rate of the interlayer into the alloy members. The process is preferably further characterized by isothermal solidification of the interlayer after the diffusion bonding temperature has been reached.

26 Claims, 2 Drawing Sheets



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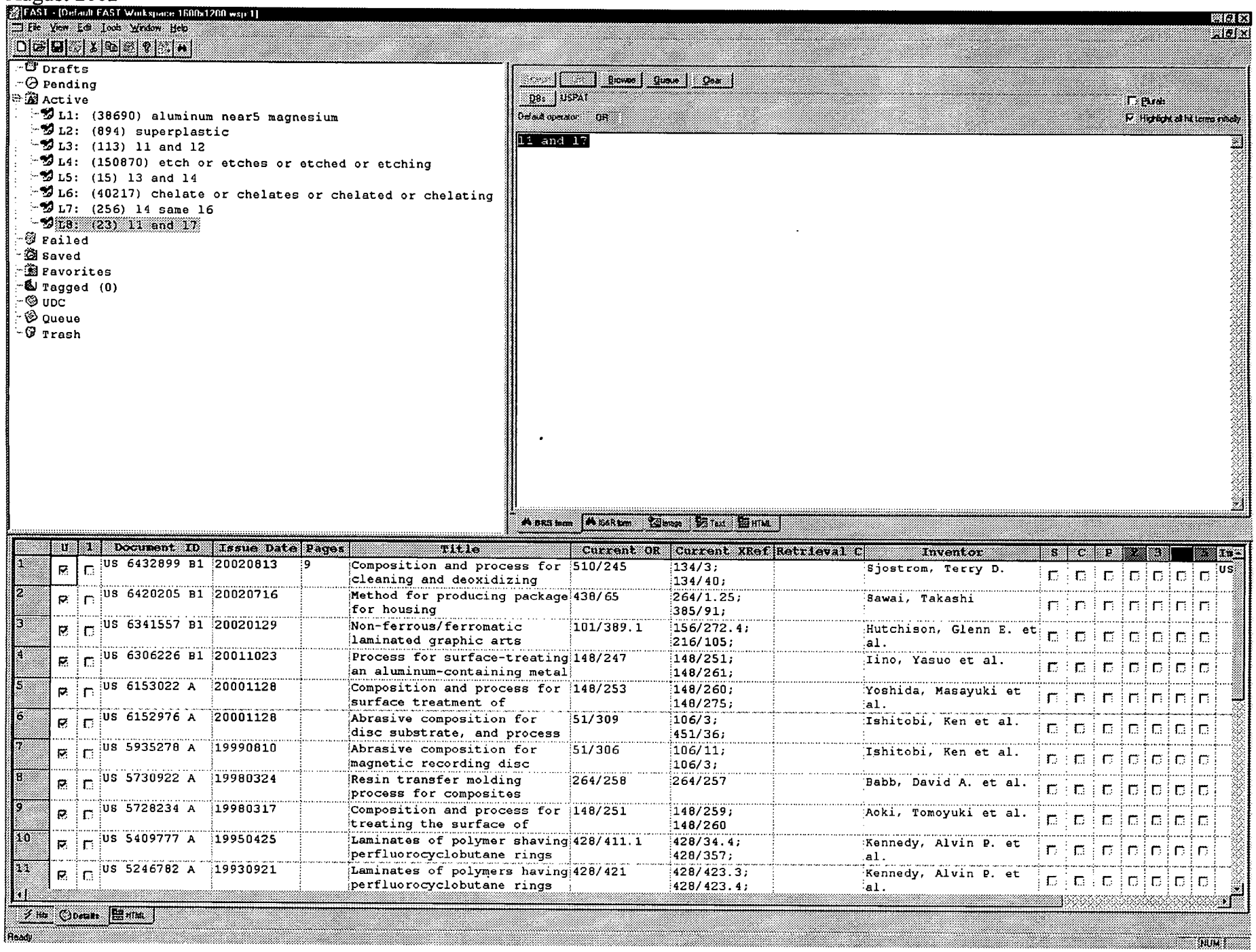

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1	☑	☐	US 6432899 B1	20020813	9	Composition and process for cleaning and deoxidizing	510/245	134/3; 134/40;		Sjostrom, Terry D.	☐	☐	☐	☐	☐	☐	☐	US
2	☑	☐	US 6420205 B1	20020716		Method for producing package for housing	438/65	264/1.25; 385/91;		Sawai, Takashi	☐	☐	☐	☐	☐	☐	☐	
3	☑	☐	US 6341557 B1	20020129		Non-ferrous/ferromatic laminated graphic arts	101/389.1	156/272.4; 216/105;		Hutchison, Glenn E. et al.	☐	☐	☐	☐	☐	☐	☐	
4	☑	☐	US 6306226 B1	20011023		Process for surface-treating an aluminum-containing metal	148/247	148/251; 148/261;		Iino, Yasuo et al.	☐	☐	☐	☐	☐	☐	☐	
5	☑	☐	US 6153022 A	20001128		Composition and process for surface treatment of	148/253	148/260; 148/275;		Yoshida, Masayuki et al.	☐	☐	☐	☐	☐	☐	☐	
6	☑	☐	US 6152976 A	20001128		Abrasive composition for disc substrate, and process	51/309	106/3; 451/36;		Ishitobi, Ken et al.	☐	☐	☐	☐	☐	☐	☐	
7	☑	☐	US 5935278 A	19990810		Abrasive composition for magnetic recording disc	51/306	106/11; 106/3;		Ishitobi, Ken et al.	☐	☐	☐	☐	☐	☐	☐	
8	☑	☐	US 5730922 A	19980324		Resin transfer molding process for composites	264/258	264/257		Babb, David A. et al.	☐	☐	☐	☐	☐	☐	☐	
9	☑	☐	US 5728234 A	19980317		Composition and process for treating the surface of	148/251	148/259; 148/260		Aoki, Tomoyuki et al.	☐	☐	☐	☐	☐	☐	☐	
10	☑	☐	US 5409777 A	19950425		Laminates of polymer shaving perfluorocyclobutane rings	428/411.1	428/34.4; 428/357;		Kennedy, Alvin P. et al.	☐	☐	☐	☐	☐	☐	☐	
11	☑	☐	US 5246782 A	19930921		Laminates of polymers having perfluorocyclobutane rings	428/421	428/423.3; 428/423.4;		Kennedy, Alvin P. et al.	☐	☐	☐	☐	☐	☐	☐	

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2	US 6420205 B1	22						☑				USPAT
3	US 6341557 B1	17						☑				USPAT
4	US 6306226 B1	11						☑				USPAT
5	US 6153022 A	8					☑					USPAT
6	US 6152976 A	6					☑					USPAT
7	US 5935278 A	7					☑					USPAT

US-PAT-NO: 6306226

DOCUMENT-IDENTIFIER: US 6306226 B1

TITLE: Process for surface-treating an aluminum-containing metal

---------- KWIC ---------

Brief Summary Text - BSTX (34):

The aluminum-containing metal material usable for the surface-treating process of the present invention is selected from aluminum materials and aluminum alloy materials. The aluminum alloy is preferably selected from aluminum-magnesium alloys, aluminum -silicon alloys and aluminum-manganese alloys. These aluminum-containing metal materials include shaped materials, for example, tubes, fins and hollow plates, for heat exchangers such as used in air conditioners.

Brief Summary Text - BSTX (67):

In the chemical etching step of the surface-treating process of the present invention, a surfactant may be added to the chemical etching liquid, to homogenize the chemical etching effect, and when aluminum is dissolved in the chemical etching liquid and the etching effect is decreased, a chelating agent for catching the dissolved aluminum may be added to the chemical etching liquid to prevent the decrease in the etching effect. In this case, the chelating agent for aluminum may be selected from citric acid, oxalic acid, tartaric acid, gluconic acid and salts of these acids.

Bad data

(12) **United States Patent**
Iino et al.

(10) **Patent No.: US 6,306,226 B1**
(45) **Date of Patent: Oct. 23, 2001**

(54) **PROCESS FOR SURFACE-TREATING AN ALUMINUM-CONTAINING METAL**

(75) Inventors: **Yasuo Iino**; **Hiroki Kojima**; **Tomohiro Ohsako**, all of Tokyo; **Hiroyoshi Sugawara**, Toyota; **Kengo Kobayashi**, Nagoya, all of (JP)

(73) Assignees: **Nihon Parkerizing Co., Ltd.**, Tokyo; **Denso Corporation**, Kariya, both of (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/177,577

(22) Filed: **Oct. 23, 1998**

(30) **Foreign Application Priority Data**

Oct. 24, 1997 (JP) 9-292931

(51) **Int. Cl.**[7] **C23C 22/48**

(52) **U.S. Cl.** 148/247; 148/251; 148/261; 148/275; 427/409

(58) **Field of Search** 148/247, 251, 148/261, 275; 427/409

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,438,877		3/1948	Spruance .	
3,658,581		4/1972	Paul et al. .	
4,830,101	*	5/1989	Ohara et al.	427/409
5,052,421	*	10/1991	McMillen	148/275
5,538,075		7/1996	Mizuno et al. .	
5,614,585	*	3/1997	Matsukawa et al.	148/251

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0 178 020	4/1986	(EP) .
0 200 546	11/1986	(EP) .
0 623 653	11/1994	(EP) .
0 676 250	10/1995	(EP) .
2295828	6/1996	(GB) .
61 250495	11/1986	(JP) .
2-1031133	4/1990	(JP) .
4-148196	5/1992	(JP) .
7-048682	2/1995	(JP) .

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Merriman, A.D., "A Dictionary of Metallurgy", MacDonald & Evans, Ltd., London, pp. 79–80, 1958 (No Month Date Available).*

Patent Abstracts of Japan, vol. 095, No. 005, Jun. 30, 1995 & JP 07 048682 A (Calsonic Corp), Feb. 21, 1995.

* cited by examiner

Primary Examiner—Roy King
Assistant Examiner—Andrew L. Oltmans
(74) *Attorney, Agent, or Firm*—Pillsbury Winthrop LLP

(57) **ABSTRACT**

An aluminum-containing metal material for, for example, a heat-exchanger for motorcars is surface-treated by chemically etching an Al-containing metal material surface, forming a first protective layer on the etched surface by a chemical conversion treatment with an aqueous solution of Zr phosphate or Ti phosphate, and coating the first protective layer with a second protective layer containing a hydrophilic resin including non-cross-linked hydrophilic functional groups and at least partially cross-linked reactive functional groups different from the hydrophilic functional groups, to impart high hydrophilicity and resistance to odor generation and corrosion to the aluminum-containing metal material surface.

6 Claims, No Drawings

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August 2002

FAST Browser - 18: (23) 1 and 7 | US 4778533 A | Tag: S | Doc: 17/23 (SORTED) | Format: KWIC

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12	US 5211843 A	7						☑				USPAT
13	US 5108620 A	9						☑				USPAT
14	US 5026440 A	9						☑				USPAT
15	US 4960511 A	7						☑				USPAT
16	US 4826605 A	9						☑				USPAT
17	US 4778533 A	5						☑				USPAT
18	US 4346128 A	23										USPAT

In Japanese Pat. No. 59/205,488, there is disclosed a method of removing magnesium oxide film from an aluminum-magnesium alloy product to improve the adhesion of coatings to said product. More particularly, the reference teaches treating said product, after degreasing and/or etching, with an alkali-based solution which includes a sequestering agent of either 1% ethylenediamine tetraacetic acid (EDTA) or 3% sodium hexametaphosphate.

Brief Summary Text - BSTX (6):

In still other methods of chemically treating aluminum-magnesium alloy sheet product, magnesium oxide is allowed to freely form on the product surface during alkaline etching. It is then later removed by treatment with an acidic solution, such as phosphoric acid or nitric acid. Two-stage cleaning processes are costly, however, in terms of the additional solutions, treatment areas and monitoring required. It is generally known to use 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP) in conjunction with aluminum and aluminum alloys. For example, U.S. Pat. No. 3,687,858 teaches adding between 0.00-0.2% by weight of HEDP to a solution which comprises: from 0.5 to 15% caustic alkali, from 0.005 to 0.2% of a polycarboxylic acid salt having more than 10 carboxyl groups; and from 0.003% to 0.1% barium, strontium or, most preferably, calcium. Treatment with the above solution supposedly has a favorable effect on the adhesion of paints to aluminum surfaces in many instances. The reference is not specifically directed to aluminum-magnesium alloy sheet product, however. In fact, U.S. Pat. No. 3,687,858 neither teaches nor suggests inhibiting the formation of magnesium oxide-containing film on or improving the brightness levels of the sheet product herein.

Brief Summary Text - BSTX (7):

Hydroxyphosphonic acids, such as HEDP, are used to retard precipitation of aluminum corrosion products from phosphate-borate type, ethylene glycol-based antifreeze formulations, as in U.S. Pat. No. 4,320,023. HEDP also seals the surfaces of anodized aluminum alloys according to U.S. Pat. No. 3,900,370. Lastly, U.S. Pat. No. 4,485,027 discloses degreasing aluminum workpieces with a solution containing 60 g/l of 50% NaOH and 50 g/l of the following dispersion: 18% boric acid; 77.5% orthophosphoric acid; 0.5% alkylbenzenesulfonic acid; 2% of an ethylene oxide adduct on a nonyl phenol; and 2% of 1-hydroxyethane-1,1-diphosphonic acid (another name for "HEDP"). The latter reference acknowledges formation of a white coating on metal surfaces treated with an orthophosphoric acid-containing solution. It does not, however, teach or suggest inhibiting the formation of magnesium oxide-containing film on aluminum-magnesium alloy sheet product.

Brief Summary Text - BSTX (9):

In U.S. Pat. No. 4,010,086, there is disclosed a method for electrocleaning metals, preferably steel. The method comprises positioning metallic articles in a bath and passing electrical current therethrough. More particularly, said bath includes a sufficient amount of an alkaline metal hydroxide and an effective amount of a cleaning agent selected from the group consisting of 1-hydroethylidene-1,1-diphosphonic acid (HEDP), an alkali metal salt of HEDP and mixtures thereof. As stated therein, the addition of said cleaning agent enhances the cleaning power of sodium or potassium hydroxide to remove rolling oil, tramp mill oil and steel fines. Iron sequestering agents may also be

United States Patent [19]

Gregory et al.

[11] **Patent Number: 4,778,533**

[45] **Date of Patent: Oct. 18, 1988**

[54] **ALUMINUM-MAGNESIUM ALLOY SHEET PRODUCT AND METHOD FOR INHIBITING FORMATION OF A FILM THEREON**

[75] Inventors: George T. Gregory, Lower Burrell; Donald L. Nock, New Kensington, both of Pa.

[73] Assignee: Aluminum Company of America, Pittsburgh, Pa.

[21] Appl. No.: 10,626

[22] Filed: Feb. 4, 1987

[51] Int. Cl.[4] C23G 1/00; C23F 1/00

[52] U.S. Cl. 134/29; 134/40

[58] Field of Search 134/2, 3, 22.14, 40, 134/41, 25.1, 25.4, 25.3; 428/457

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,655,467	4/1972	Sopp, Jr.	156/22
3,687,858	8/1972	Geisler et al.	252/156
3,900,370	8/1975	Germscheid et al.	204/38 A
4,010,086	3/1977	Barrett et al.	204/141.5
4,320,023	3/1982	White	252/75
4,485,027	11/1984	Rosmann et al.	252/90

FOREIGN PATENT DOCUMENTS

753208	2/1967	Canada	134/16
59-205488	11/1984	Japan .	

OTHER PUBLICATIONS

Monsanto Technical Bulletin No. IC/SCS-323, entitled "Dequest ® 2010 Phosphonate; For Scale and Corrosion Control, Chelation, Dispersion".

Primary Examiner—Nancy A. B. Swisher
Attorney, Agent, or Firm—Gary P. Topolosky

[57] **ABSTRACT**

An aluminum-magnesium alloy sheet product having improved levels of brightness for use as container stock including food containers and beverage container ends, said sheet product chemically treated with an alkaline-based cleaner containing a sufficient amount of a compound of 1-hydroxyethylidene-1, 1-diphosphonic acid (HEDP) to inhibit the formation of a magnesium oxide-containing film thereon. Preferably, the sheet product is cast from a 5000 Series aluminum alloy (Aluminum Association designation) and the cleaner contains between about 0.2–0.7% by weight of the HEDP compound. A method for improving the brightness levels of an aluminum-magnesium alloy sheet product is further disclosed. The method comprises chemically treating the sheet product with an alkaline-based cleaner containing between about 0.2–0.7% by weight of an HEDP compound to inhibit the formation of a magnesium oxide-containing film thereon.

11 Claims, No Drawings

18 #17

August 2002

FAST Browser - 18: (23) 1 and 7 | US 4778533 A | Tag: S | Doc: 17/23 (SORTED) | Format: KWIC

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16	US 4826605 A	9											USPAT
17	US 4778533 A	5											USPAT
18	US 4346128 A	23											USPAT

Detailed Description Text - DETX (2):

The aluminum-magnesium alloy sheet product of this invention has improved levels of brightness for having been chemically treated with an alkaline-based cleaner containing a sufficient amount of a compound of 1-hydroxyethylidene-1,1-diphosphonic acid (hereinafter "HEDP") to inhibit the formation of a magnesium oxide-containing film thereon. Preferably, the sheet product has an average thickness between about 0.009-0.0014 inch (0.229-0.356 mm). Within this thickness range, the sheet product is suitable for use as container stock. It is especially used for formation into food containers and beverage container ends by stamping, pressing or other known means. Most preferably, the sheet product of the invention is cast from a 5000 Series aluminum alloy (Aluminum Association designation). The aluminum alloys which more commonly develop film formation and brightness level problems include 5182, 5042, 5082, and 5352 (Aluminum Association designations).

Detailed Description Text - DETX (3):

After being rolled to the above preferred thickness level, aluminum-magnesium alloy sheet product is degreased and cleaned to remove any milling oils, lubricants, fines and the like from the product surface. Typically, the sheet product is chemically treated with an alkaline-based cleaner for this purpose. The cleaner includes a caustic or carbonate diluted in deionized water, and one or more of the following: a chelating agent for holding dissolved aluminum in solution, an emulsifier, a surfactant, and a foam controlling agent. After treatment with the above cleaner, aluminum-magnesium alloy sheet product is rinsed repeatedly and dried. During the aging of said sheet product, a whitish, opaque layer of film forms on the product surface. This film, which consists essentially of magnesium oxide, detracts from the appearance and value of the sheet product by reducing its levels of brightness. Depending upon such variables as cleaning solution temperature and concentration, etch rate and exposure time, most chemically treated aluminum-magnesium alloy sheet product is either streaked with vertically propagated, magnesium oxide deposits or completely covered with a thick cloudy layer of film.

Detailed Description Text - DETX (4):

By this invention, it was discovered that the addition of a sufficient amount of an HEDP compound to conventional alkaline-based cleaners inhibits the formation of magnesium oxide-containing film on aluminum-magnesium alloy sheet product. Minimal additions of HEDP also improve the brightness levels of the sheet product so treated. Particularly, HEDP compound is added to an existing alkaline-based cleaner to maintain a level of uncomplexed HEDP ions in a solution comprising said cleaner and the HEDP compound. The uncomplexed HEDP ions then combine readily with free magnesium ions on the product surface to inhibit the formation of film thereon. More particularly, an alkaline-based cleaner should contain between about 0.2-0.7% by weight of an HEDP compound according to this invention. HEDP may be added in amounts greater than 0.7% by weight. However, no additional benefits are realized by oversaturation with HEDP. In fact, a caustic- or carbonate-based cleaner containing about 0.44% by weight of an HEDP compound inhibits the formation of substantially all magnesium oxide-containing film on aluminummagnesium alloy sheet product.

Detailed Description Text - DETX (5):

United States Patent [19]

Gregory et al.

[11] **Patent Number: 4,778,533**

[45] **Date of Patent: Oct. 18, 1988**

[54] **ALUMINUM-MAGNESIUM ALLOY SHEET PRODUCT AND METHOD FOR INHIBITING FORMATION OF A FILM THEREON**

[75] Inventors: George T. Gregory, Lower Burrell; Donald L. Nock, New Kensington, both of Pa.

[73] Assignee: Aluminum Company of America, Pittsburgh, Pa.

[21] Appl. No.: 10,626

[22] Filed: Feb. 4, 1987

[51] Int. Cl.[4] C23G 1/00; C23F 1/00

[52] U.S. Cl. 134/29; 134/40

[58] Field of Search 134/2, 3, 22.14, 40, 134/41, 25.1, 25.4, 25.3; 428/457

[56] **References Cited**

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3,687,858	8/1972	Geisler et al.	252/156
3,900,570	8/1975	Germscheid et al.	204/38 A
4,010,086	3/1977	Barrett et al.	204/141.5
4,320,023	3/1982	White	252/75
4,435,027	11/1984	Rosmann et al.	252/90

FOREIGN PATENT DOCUMENTS

753208	2/1967	Canada	134/16
59-205488	11/1984	Japan .	

OTHER PUBLICATIONS

Monsanto Technical Bulletin No. IC/SCS-323, entitled "Dequest ® 2010 Phosphonate; For Scale and Corrosion Control, Chelation, Dispersion".

Primary Examiner—Nancy A. B. Swisher
Attorney, Agent, or Firm—Gary P. Topolosky

[57] **ABSTRACT**

An aluminum-magnesium alloy sheet product having improved levels of brightness for use as container stock including food containers and beverage container ends, said sheet product chemically treated with an alkaline-based cleaner containing a sufficient amount of a compound of 1-hydroxyethylidene-1, 1-diphosphonic acid (HEDP) to inhibit the formation of a magnesium oxide-containing film thereon. Preferably, the sheet product is cast from a 5000 Series aluminum alloy (Aluminum Association designation) and the cleaner contains between about 0.2-0.7% by weight of the HEDP compound. A method for improving the brightness levels of an aluminum-magnesium alloy sheet product is further disclosed. The method comprises chemically treating the sheet product with an alkaline-based cleaner containing between about 0.2-0.7% by weight of an HEDP compound to inhibit the formation of a magnesium oxide-containing film thereon.

11 Claims, No Drawings

18 H,B

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16	US 4826605 A	9							☑			USPAT
17	US 4778533 A	5							☑			USPAT
18	US 4346128 A	23							☑			USPAT
19	US 4192722 A	5							☑			USPAT
20	US 4066453 A	6							☑			USPAT

US-PAT-NO: 4346128

DOCUMENT-IDENTIFIER: US 4346128 A

TITLE: Tank process for plating aluminum substrates including porous aluminum castings

---------- KWIC ---------

Brief Summary Text - BSTX (20):

In the course of the development work conducted leading to the present invention, many processes were tested in an effort to consistently obtain a blister-free (tin) plating on porous aluminum substrates; especially, on aluminum castings. The adhesion requirement was that the plating must withstand baking at 200.degree.-225.degree. F. for 1 hour (a thermal adhesion test) without blistering. At the beginning of the test program, using a hot, pH tin plating bath, the below-listed process steps were used, both singly and in combination, and in virtually every sensible permutation. The result was blistered (tin) plating upon removal of the work from the plating bath, or blistering of the plating after baking. More specifically, the following process steps were examined: (i) vapor degreasing; (ii) hot, non-etch soak cleaners; (iii) room temperature, non-etch emulsion cleaners; (iv) concentrated nitric-hydrofluoric acid and chromic-nitric-hydrofluoric acid activators; (v) moderately dilute zincates (less than 300 g./l. total salts; high pH) which were employed in single, double and multiple zincating processes; (vi), hot, high pH cyanide copper strikes; (vii) high pH caustic etches; (viii) high pH caustic etches containing chelating agents (to improve smut removal); (ix) polyester resin impregnation of the porous substrates to decrease or eliminate surface porosity (this apparently decreased the occurrence of blistered plating severity, but did not eliminate it); and (x), high pH immersion tin plating instead of immersion zinc plating (zincating); all with unacceptable results.

Brief Summary Text - BSTX (22):

Thereafter, dilute nitric-sulfuric activations containing ammoniumbifluoride and dissolved aluminum, and high pH caustic etches, both with and without chelating agents, were used in conjunction with a cyanide copper strike prior to hot, high pH tin plating. Again, no blister-free tin plating could be consistently obtained on porous aluminum castings.

Brief Summary Text - BSTX (24):

Recognizing that high pH, high temperature solutions attacked aluminum and aluminum alloy substrates, especially when surface porosities are present, a low pH, low temperature acid tin bath was tested. It was found that only a very thin barrier layer of electroless nickel was required when using: (i) a room temperature, non-etch emulsion cleaner; (ii) a dilute, room temperature, low pH nitric-sulfuric acid activator containing a high degree of ammoniumbifloride--i.e., on the order of 12 oz./gal., or more, ammoniumbiflouride--and dissolved aluminum; (iii) a dilute, room temperature zincate bath, preferably containing chelating agents to restrict the chemical activity of the zinc to complex dissolved by-products of the zincating reaction; and (iv), an outermost layer of plating, if other than electroless

United States Patent [19]

Loch

[11] **4,346,128**

[45] **Aug. 24, 1982**

[54] **TANK PROCESS FOR PLATING ALUMINUM SUBSTRATES INCLUDING POROUS ALUMINUM CASTINGS**

[75] Inventor: David M. Loch, Seattle, Wash.

[73] Assignee: The Boeing Company, Seattle, Wash.

[21] Appl. No.: 265,099

[22] Filed: May 19, 1981

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 135,679, Mar. 31, 1980, abandoned.

[51] Int. Cl. C23C 3/02

[52] U.S. Cl. 427/328; 427/405; 427/406; 427/436; 427/438

[58] Field of Search 427/436, 406, 438, 437, 427/328, 405

[56] References Cited

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3,180,715	4/1965	Simon	427/437
3,281,366	10/1966	Colonel	427/438
3,466,156	9/1969	Peters et al.	427/438
3,738,818	6/1973	Stone et al.	427/438

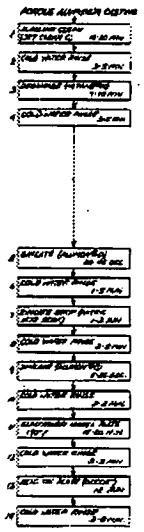
Primary Examiner—Ralph S. Kendall

Attorney, Agent, or Firm—Hughes, Barnard & Cassidy

[57] ABSTRACT

An improved tank process for plating aluminum substrates which is especially advantageous for plating porous aluminum castings and, blister-free plated aluminum substrates produced thereby, characterized in that the aluminum piece parts are: (i) emulsion cleaned in a room temperature alkaline cleaner; (ii) immersed in a room temperature dilute acid, inorganic, fluoride salt solution to dissolve heavy oxides and surface silicon while minimizing etching and intergranular attack of the aluminum substrate such, for example, as a porous cast aluminum substrate; (iii) immersed in a room temperature dilute zincate bath for applying a relatively thin zinc protective coating, preferably utilizing a double zincate immersion process with an intermediate prolonged (1-3 min.) nitric acid soak to reduce the zincate deposition rate and to thereby provide improved zincate adhesion; (iv) plated with a non-porous strike applied directly on the zincate protective coating—e.g., by electroplating or by electroless plating methods such, for example, as by immersion in a bath of nickle-hypophosphite material maintained at a temperature of approximately 190° F.; and (v), immersed in a metal plating bath such, for example, as a tin plating bath—preferably, a low pH, room temperature acid tin bath—so as to apply a blister-free electrically conductive surface on the porous aluminum casting.

18 Claims, 24 Drawing Figures



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US-PAT-NO: 3688015

DOCUMENT-IDENTIFIER: US 3688015 A

TITLE: CONDUCTIVE ALUMINUM TUBES FOR METAL-ENCLOSED, COMPRESSED GAS-INSULATED CONDUCTORS AND THE LIKE

---------- KWIC ---------

Detailed Description Text - DETX (8):

An aqueous solution of a strong alkali such as sodium hydroxide, potassium hydroxide and the like, can be employed as the etchant. Caustic is preferred on the basis of availability and economics. The caustic employed generally has a pH of at least about 13 and contains surface active agents and chelating agents. The surface active agents and chelating agents are employed in order to maintain better control over the rate of etching and to lower the surface tension of the solution so as to obtain more intimate contact with the surfaces being treated. Without such agents, the etched surface would become pitted and uneven instead of being evenly etched . The agents also serve to give a uniform rate of etch over an extended period of time and additionally keep the aluminum metal from precipitating out of the solution. Without such chelating agents, gelatinous aluminum hydroxide would precipitate and could dry as an inert white scale of aluminum oxide on the side of the etching tank.

Detailed Description Text - DETX (13):

In the next step of the preferred process of the preferred embodiment of the invention, the washed, etched aluminum pieces are treated with an oxidizing agent in order to remove the black residual film thereon which includes compounds of aluminum and the alloying metals such as silicon, magnesium and copper, which is left on the surface by the etching operation. Suitable oxidizing media include the hypophosphates, ceric perchlorate, ceric nitrate, ceric sulfate, potassium permanganate, potassium dichromate, potassium bromate, potassium iodate, iodine-potassium iodide, potassium ferricyanide, ferric chloride, cupric chloride, ammonium persulfate, and the like; oxidizing mineral acids such as nitric, hydrochloric, hypochloric, phosphoric, periodic, sulfuric, chromic, and the like; peracids; peroxides; organic and inorganic ozonites such as KO.sub.3, and the like. The preferred oxidizing agent is nitric acid in the form of in about 5-20 volume percent water solution. Any temperature in the range of about 50.degree.-100.degree. F. is satisfactory and it is preferred to perform this treatment step at ambient temperatures. Treatment time is advantageously measured by observing the color of the treated surfaces since the surfaces are black before subjected to the oxidizing medium and are almost white at the end of the treatment. In general, a treating time of about 10-20 minutes is sufficient.

United States Patent

Graybill

[15] **3,688,015**

[45] **Aug. 29, 1972**

[54] **CONDUCTIVE ALUMINUM TUBES FOR METAL-ENCLOSED, COMPRESSED GAS-INSULATED CONDUCTORS AND THE LIKE**

[72] Inventor: **Howard W. Graybill**, 3015 McClellan Drive, Greensburg, Pa. 15601

[22] Filed: **Jan. 14, 1972**

[21] Appl. No.: **217,829**

Related U.S. Application Data

[62] Division of Ser. No. 138,094, April 28, 1971.

[52] U.S. Cl. ..... 174/16 B, 174/28, 174/99 B

[51] Int. Cl. H01b 9/04

[58] Field of Search ... 174/28, 29, 16 B, 99 B, 133 B, 174/129 B, 15 C; 134/2

[56] **References Cited**

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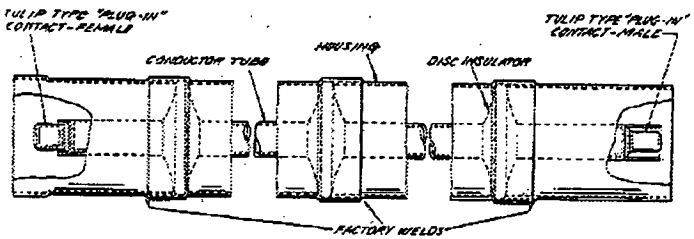
2,795,490	6/1957	Newman et al.	134/2 UX
2,872,301	2/1959	Massengale	134/2 X

Primary Examiner—Lewis H. Myers
Assistant Examiner—A. T. Grimley
Attorney—Ostrolenk, Faber, Gerb & Soffen

[57] **ABSTRACT**

The confronting interior surfaces of the metallic central conductor and housing of an isolated phase bus system are treated by degreasing the surfaces of the central conductor and housing, etching the degreased surfaces, washing the etched surfaces, contacting the washed surfaces with an oxidizing agent, washing the resulting surfaces and drying the resulting treated surfaces under dust-free conditions. The process provides surfaces which are devoid of all particles which can deteriorate or otherwise destroy the dielectric integrity of the isolated phase bus while at the same time having surfaces of higher coefficients of emissivity as compared with conventional untreated surfaces thereby reducing the operating temperatures of the bus run.

2 Claims, 1 Drawing Figure



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19	US 4192722 A	5						☑				USPAT
20	US 4066453 A	6						☑				USPAT
21	US 3688015 A	6						☑				USPAT
22	US 3655467 A	4						☑				USPAT
23	US 3620804 A	4						☑				USPAT

This example is illustrative of use of soluble pyro- and polyphosphates in caustic pyro- or polyphosphate solution according to the instant invention. The following table (III) shows the results of etching a typical aluminum base alloy, ons containing magnesium, Aluminum Association Alloy 5052. ##SPC3##

Detailed Description Text - DETX (10):

This example illustrates use of representative concentrations of caustic poly- or pyrophosphate solutions according to the invention. Treatment was for 30 seconds at 140.degrees. F in each instance. Results are shown in Table IV, which follows. The alloy treated was a magnesium-containing aluminum base alloy.

TABLE IV

Claims Text - CLTX (1):

1. In a process for etching an aluminum base alloy, the improvement comprising treating said alloy with a solution consisting essentially of from about 0.1 to about 5 percent by weight caustic, from about 1 to about 30 percent by weight soluble pyro- or polyphosphate salt and not exceeding about 5 percent by weight of at least one substance from the group consisting of emulsifying agents, chelating agents and foam control agents at from about 120.degree. F to about 180.degree. F, thereby through a solubilizing action minimizing formation of a reaction product film on said alloy.

Claims Text - CLTX (4):

4. The improvement of claim 1 wherein the aluminum base alloy contains magnesium, the caustic is sodium hydroxide, potassium hydroxide, tribasic sodium phosphate or sodium carbonate and the soluble pyro- or polyphosphate is tetrasodium pyrophosphate, sodium tripolyphosphate, tetrapotassium pyrophosphate or potassium tripolyphosphate.

col 1 l 72 manifold point coated
over Zinc chromate

United States Patent

Sopp, Jr.

[15] **3,655,467**

[45] **Apr. 11, 1972**

[54] **ETCHING OF ALUMINUM BASE ALLOYS**

[72] Inventor: Albert L. Sopp, Jr., New Kensington, Pa.

[73] Assignee: Aluminum Company of America, Pittsburgh, Pa.

[22] Filed: May 14, 1969

[21] Appl. No.: 824,691

[52] U.S. Cl. 156/22, 252/79.4, 252/135, 252/156

[51] Int. Cl. C23g 1/32, C23g 1/26

[58] Field of Search 252/135, 156, 157, 192, 79.5; 156/22, 23, 21

[56] References Cited

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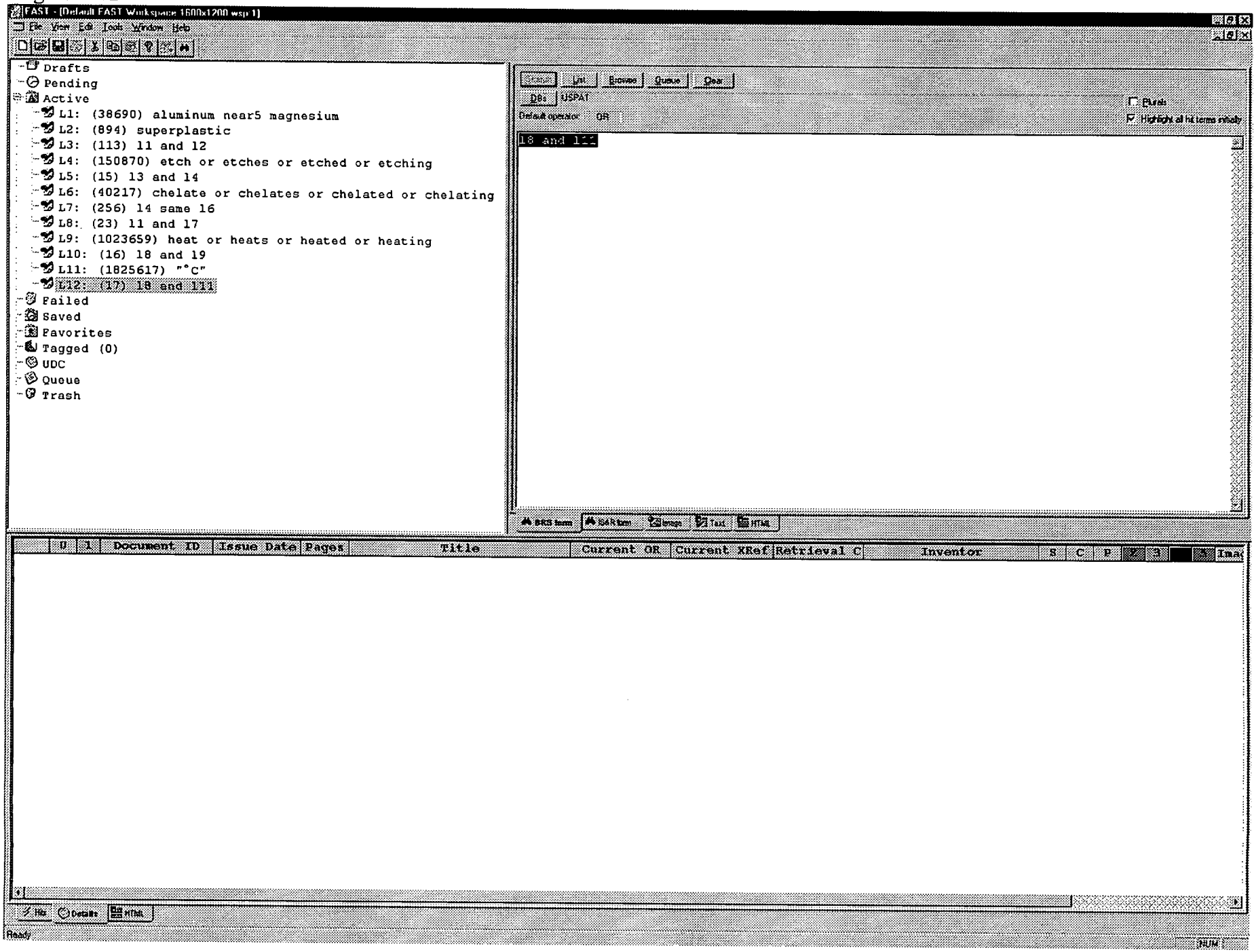
Primary Examiner—Jacob H. Steinberg
Attorney—Abram W. Hatcher

[57] ABSTRACT

Treating aluminum base alloys with a cleaning-etching solution made up of a caustic and a soluble pyro- or polyphosphate to inhibit formation of an undesirable film thereon.

4 Claims, No Drawings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L1: (38690) aluminum near5 magnesium
L2: (894) superplastic
L3: (113) l1 and l2
L4: (150870) etch or etches or etched or etching
L5: (15) l3 and l4
L6: (40217) chelate or chelates or chelated or chelating
L7: (256) l4 same l6
L8: (23) l1 and l7
L9: (1023659) heat or heats or heated or heating
L10: (16) l8 and l9
L11: (1825617) "°C"
L12: (17) l8 and l11
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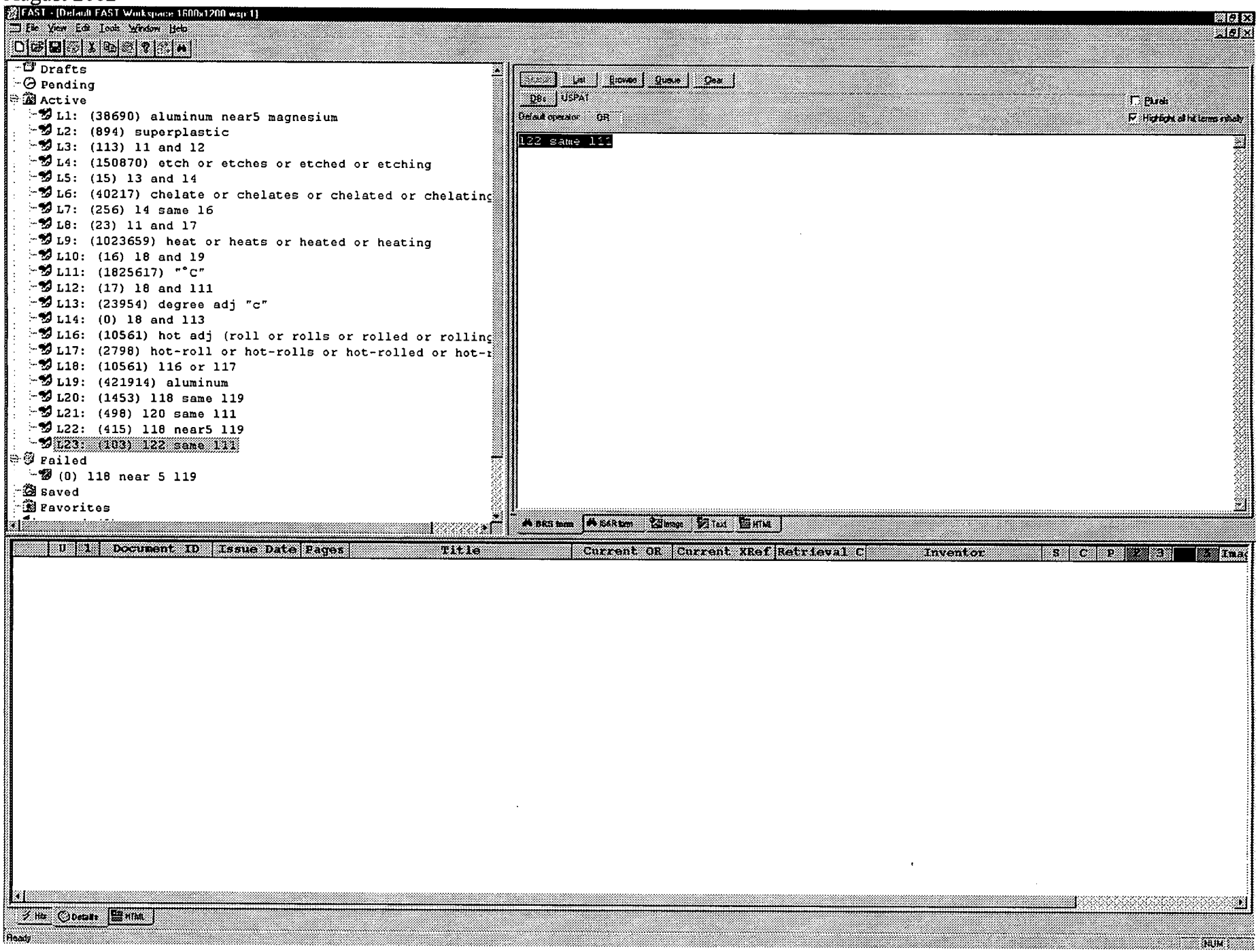
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L14: (0) l8 and l13
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L17: (2798) hot-roll or hot-rolls or hot-rolled or hot-r
L18: (10561) l16 or l17
L19: (421914) aluminum
L20: (1453) l18 same l19
L21: (498) l20 same l11
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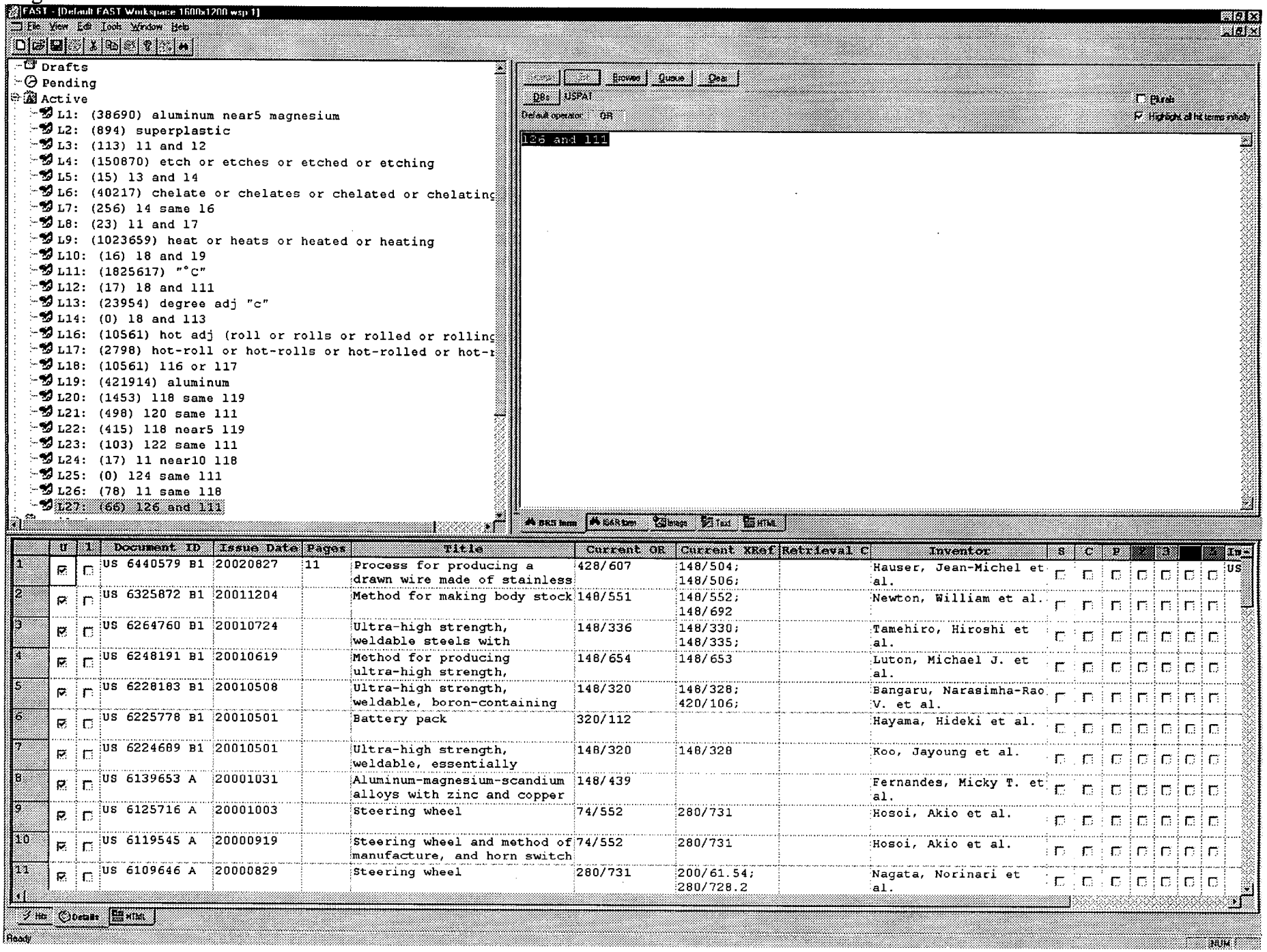
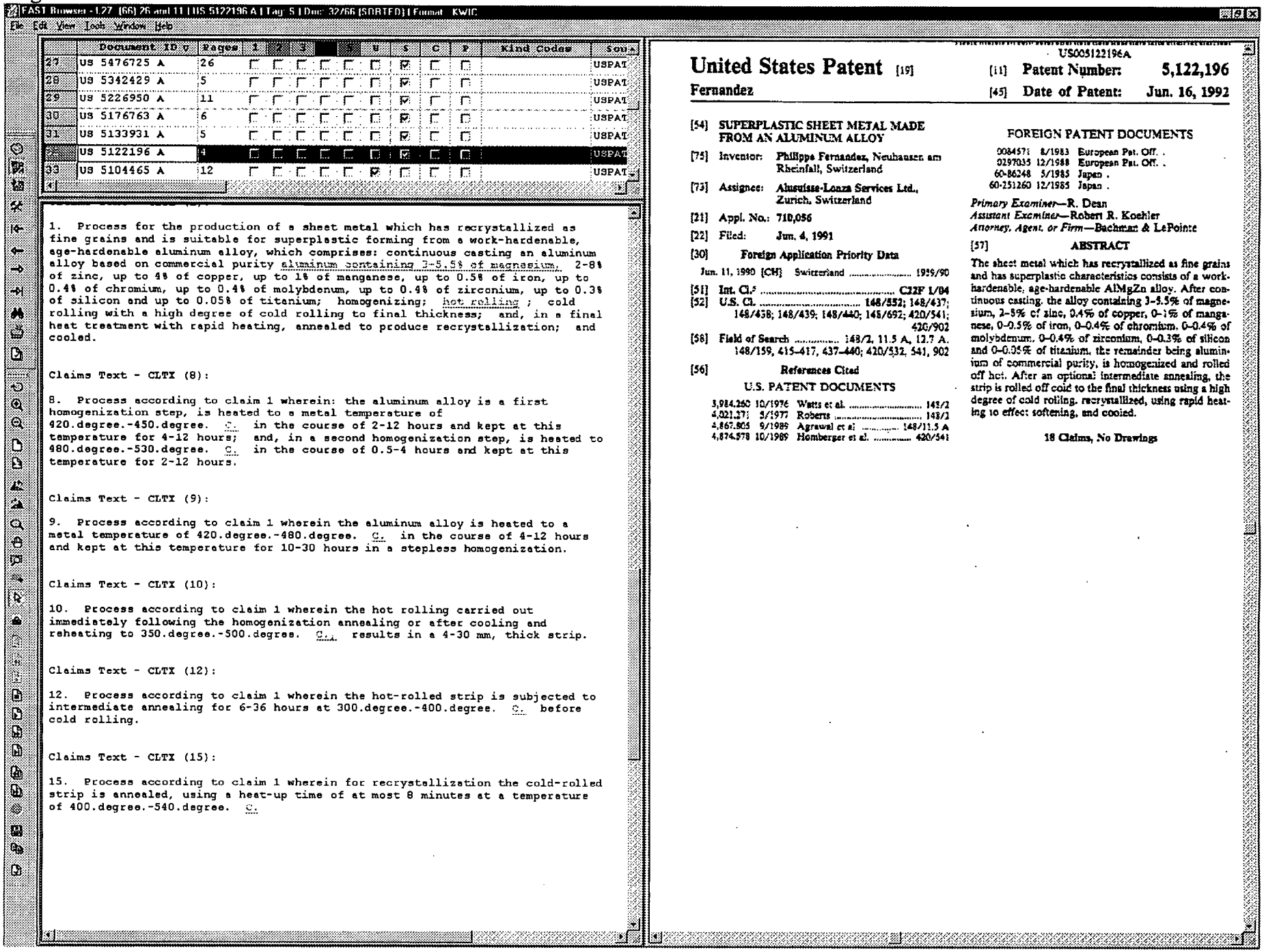
August 2002



	U	1	Document ID	Issue Date	Pages	Title	Current OR	Current XRef	Retrieval C	Inventor	S	C	P	2	3	4	5	In
1	☑	☐	US 6440579 B1	20020827	11	Process for producing a drawn wire made of stainless	428/607	148/504; 148/506;		Hauser, Jean-Michel et al.	☐	☐	☐	☐	☐	☐	☐	US
2	☑	☐	US 6325872 B1	20011204		Method for making body stock	148/551	148/552; 148/692		Newton, William et al.	☐	☐	☐	☐	☐	☐	☐	
3	☑	☐	US 6264760 B1	20010724		Ultra-high strength, weldable steels with	148/336	148/330; 148/335;		Tamehiro, Hiroshi et al.	☐	☐	☐	☐	☐	☐	☐	
4	☑	☐	US 6248191 B1	20010619		Method for producing ultra-high strength,	148/654	148/653		Luton, Michael J. et al.	☐	☐	☐	☐	☐	☐	☐	
5	☑	☐	US 6228183 B1	20010508		Ultra-high strength, weldable, boron-containing	148/320	148/328; 420/106;		Bangaru, Narasimha-Rao V. et al.	☐	☐	☐	☐	☐	☐	☐	
6	☑	☐	US 6225778 B1	20010501		Battery pack	320/112			Hayama, Hideki et al.	☐	☐	☐	☐	☐	☐	☐	
7	☑	☐	US 6224689 B1	20010501		Ultra-high strength, weldable, essentially	148/320	148/328		Koo, Jayoung et al.	☐	☐	☐	☐	☐	☐	☐	
8	☑	☐	US 6139653 A	20001031		Aluminum-magnesium-scandium alloys with zinc and copper	148/439			Fernandes, Micky T. et al.	☐	☐	☐	☐	☐	☐	☐	
9	☑	☐	US 6125716 A	20001003		Steering wheel	74/552	280/731		Hosoi, Akio et al.	☐	☐	☐	☐	☐	☐	☐	
10	☑	☐	US 6119545 A	20000919		Steering wheel and method of manufacture, and horn switch	74/552	280/731		Hosoi, Akio et al.	☐	☐	☐	☐	☐	☐	☐	
11	☑	☐	US 6109646 A	20000829		Steering wheel	280/731	200/61.54; 280/728.2		Nagata, Norinari et al.	☐	☐	☐	☐	☐	☐	☐	

August 2002



US005122196A

United States Patent [19]

Fernandez

[11] Patent Number: 5,122,196

[45] Date of Patent: Jun. 16, 1992

[54] SUPERPLASTIC SHEET METAL MADE FROM AN ALUMINUM ALLOY

[75] Inventor: Philippe Fernandez, Neuhausen am Rheinfall, Switzerland

[73] Assignee: Alusuisse-Lonza Services Ltd., Zurich, Switzerland

[21] Appl. No.: 710,056

[22] Filed: Jun. 4, 1991

[30] Foreign Application Priority Data

Jun. 11, 1990 [CH] Switzerland 1959/90

[51] Int. Cl.[5] C22F 1/04

[52] U.S. Cl. 148/552; 148/437; 148/438; 148/439; 148/440; 148/692; 420/541; 420/902

[58] Field of Search ..... 148/2, 11.5 A, 12.7 A, 148/159, 415-417, 437-440; 420/532, 541, 902

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Primary Examiner—R. Dean
Assistant Examiner—Robert R. Koehler
Attorney, Agent, or Firm—Bachman & LePointe

[57] ABSTRACT

The sheet metal which has recrystallized as fine grains and has superplastic characteristics consists of a work-hardenable, age-hardenable AlMgZn alloy. After continuous casting, the alloy containing 3–5.5% of magnesium, 2–8% of zinc, 0.4% of copper, 0–1% of manganese, 0–0.5% of iron, 0–0.4% of chromium, 0–0.4% of molybdenum, 0–0.4% of zirconium, 0–0.3% of silicon and 0–0.05% of titanium, the remainder being aluminium of commercial purity, is homogenized and rolled off hot. After an optional intermediate annealing, the strip is rolled off cold to the final thickness using a high degree of cold rolling, recrystallized, using rapid heating to effect softening, and cooled.

18 Claims, No Drawings

August 2002

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	Document ID	Pages	1	2	3	4	5	6	S	C	P	Kind Codes	Sou
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30	US 5176763 A	6							☑				USPAT
31	US 5133931 A	5							☑				USPAT
32	US 5122196 A	4							☑				USPAT
33	US 5104465 A	12							☑				USPAT
34	US 5102477 A	9							☑				USPAT

US-PAT-NO: 5104465

DOCUMENT-IDENTIFIER: US 5104465 A

TITLE: Aluminum alloy sheet stock

---------- KWIC ---------

INVENTOR - INNM (1):

McAuliffe; Donald C.

Inventor Group - INGP (1):

McAuliffe; Donald C. Golden CO

Abstract Text - ABTX (1):

An aluminum sheet having novel properties is provided. The strip stock is suitable for the fabrication of both container ends and container bodies in thinner gauges than are typically employed, has low earing characteristics and may be derived from recycled aluminum scrap. An alloy particularly suited to the fabrication of the aluminum sheet preferably has a magnesium concentration of from about 2 to about 2.8 weight percent and a manganese concentration of from about 0.9 to about 1.6 weight percent. A process particularly suited to the fabrication of the aluminum sheet preferably includes continuous chill block casting the alloy melt into a strip, hot rolling the strip to a first thickness, annealing the hot rolled strip and then cold rolling the annealed strip to a final thickness. Cold rolling preferably includes two stages with an intermediate anneal step between the two stages. The process increasess tensile and yield strength while decreasing earing percentage, even in very thin gauges, such as 0.010 inches.

Brief Summary Text - BSTX (14):

Several patents pertain to low earing aluminum alloys or processes for their production. For example, U.S. Pat. No. 4,238,248 by Gyongyos et al., issued on Dec. 9, 1980, discloses a process for producing a low earing aluminum alloy. A melt of 3004 alloy, or an alloy in which the combined concentration of manganese and magnesium is between 2 percent and 3.3 (unless otherwise indicated, all percentages will be weight percent) percent and in which the ratio of magnesium:manganese is between 1.4:1 and 4.4:1, is cast and then held for 2 to 15 minutes between 400.degree. C. and the alloy's liquidus temperature (the temperature at which the alloy's phase changes between a liquid state and a solid/liquid state, in this case, approximately 600.degree. C.). It is then hot rolled at a temperature between 300.degree. C. and the non-equilibrium solidus temperature (the temperature at which the alloy's phase changes between the solid/liquid state and a completely solid state), coiled and cooled to room temperature. A first cold rolling stage reduces the thickness by at least 50 percent and is followed by a flash annealing stage at 350.degree. C. to 500.degree. C. for less than 90 seconds. A second cold rolling stage results in further reduction of up to 75 percent.

US005104465A

United States Patent [19]

McAuliffe et al.

[11] Patent Number: 5,104,465

[45] Date of Patent: Apr. 14, 1992

[54] ALUMINUM ALLOY SHEET STOCK

[75] Inventors: Donald C. McAuliffe, Golden; Ivan M. Marsh, Denver, both of Colo.

[73] Assignee: Golden Aluminum Company, Lakewood, Colo.

[21] Appl. No.: 577,880

[22] Filed: Sep. 5, 1990

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 315,408, Feb. 24, 1989, Pat. No. 4,975,790.

[51] Int. Cl.[5] C22C 21/06; C21D 8/00

[52] U.S. Cl. ..... 148/439; 148/2; 148/11.5 A; 148/437; 148/440; 206/139; 420/533

[58] Field of Search ..... 148/2, 11.5 A, 437, 148/439, 440; 206/139; 420/533

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Primary Examiner—R. Dean
Assistant Examiner—Robert R. Koehler
Attorney, Agent, or Firm—Sheridan, Ross & McIntosh

[57] ABSTRACT

An aluminum sheet having novel properties is provided. The strip stock is suitable for the fabrication of both container ends and container bodies in thinner gauges than are typically employed, has low earing characteristics and may be derived from recycled aluminum scrap. An alloy particularly suited to the fabrication of the aluminum sheet preferably has a magnesium concentration of from about 2 to about 2.8 weight percent and a manganese concentration of from about 0.9 to about 1.6 weight percent. A process particularly suited to the fabrication of the aluminum sheet preferably includes continuous chill block casting the alloy melt into a strip, hot rolling the strip to a first thickness, annealing the hot rolled strip and then cold rolling the annealed strip to a final thickness. Cold rolling preferably includes two stages with an intermediate anneal step between the two stages. The process increases tensile and yield strength while decreasing earing percentage, even in very thin gauges, such as 0.010 inches.

18 Claims, 4 Drawing Sheets